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N° 10,405 A.D. 1912

Date of Application, 2nd May, 1912

Complete Specification Left, 7th June, 1912—Accepted, 26th Sept., 1912

PROVISIONAL SPECIFICATION.

Improvements in or connected with Ships' Construction.

I, THOMAS TURTON JONES, of 656, Royal Liver Building, Pier Head, Liverpool, in the County of Lancaster, M.I.N.A., Naval Architect, do hereby declare the nature of this invention to be as follows:—

This invention has reference to the construction of ships; and has chiefly for its object to provide a construction which, when the ship is struck or damaged by collision or similar accident, shall limit or diminish the degree of loss of stability or safety of the ship due thereto, relatively to that they are liable to, if constructed according to the present or usual system. Or in other words, its chief object is to render such ships safer generally, and less liable to be sunk by being struck by or colliding with another ship or object, or like accident.

In the following description of ships' structure, the improvements hereunder are comprised.

In a ship, the sides and bottom, say up to or some distance above the water level, the ship is formed or comprised of a plurality of large tubes or cylinders horizontally disposed in parallel, and extending for the full length of the ship, or major portion of it, say; and all inter-connected, and provided at intervals with diaphragms or partitions (say from twenty to forty feet apart), and with stiffening rings between the diaphragms pitched apart at comparatively short intervals; and these cylinders will be placed closely together, and also connected together on their outside by plates, which are in one construction curved inwards or slightly concave; whilst on the inner side of these tubular members or cylinders are "web-frames", into recesses in which the inner side of the cylinders or tubes enter, and to which they are fastened by angle irons or other suitable fastening means. And again on the inside of this, there is an inner skin of the ship, which say will be extended from below say from the usual tank top, up to above the water line.

In the web-frames, suitable openings will be provided for gaining access from one space between said frames to another; and above this tubular construction, will be the ordinary interspaced vertical frame construction, which will extend from the upper cylinder or tube, and be fastened on to its upper and inner side, and then bent outwards so as to join up with the curved or concave side plates, on the upper and outside of the uppermost tube or cylinder.

The outside of the ship will, therefore from a point more or less above water line down and at the bottom, consist of parallel series of parts, consisting alternately of the cylinder outside side portions, and concave plates, and on the outside portions of the tubes or cylinders.

The keelsons, of which there will be a plurality, as usual, will be between groups of the tubes or cylinders, and will be connected up by special plates between the two tubes or cylinders, which come on each side of the keelsons.

In some cases, instead of the continuous inner lining or skin or shell being employed, separate from but connected to the tubes or cylinders, and on the inner side of the web-frames to which it is fastened, the inner skin may be

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formed of curved or concave plates extending between the sides or shells of the tubes or cylinders, similarly to those used on the outer shell or skin.

The stiffening rings in the tubes or cylinders may be spaced apart at distances equal to those of ordinary frames of ship construction.

This tubular construction accomplishes several effects and ends, namely:— In the first place it gives great strength; secondly, if the ship is struck below the water line, or at the sides, where this construction exists, the entrance of water to the ship will be limited to the portions of the cylinder or cylinders so damaged; that is to say they being longitudinal, the spaces between their diaphragms or divisions if cut or damaged on the outside, the inner part of the side structure of the ship is not so liable to be strained or the web-frames and inner skin torn away. That is to say the damage will be largely localised to the point of actual contact or piercing.

Furthermore, in any event, the cylinders or tubes serve as buoyancy spaces or tanks, which help to hold up the ship, and prevent her sinking, in case of the holds between the main bulk heads of the ship being filled with the water by any cause.

With regard to the size of these cylinders or tubes, they will generally vary between three and five or six feet in diameter.

In some cases, this tubular or cylindrical construction may be employed horizontally across the ship, say at the lower deck, the cylinders being arranged longitudinally as in the sides and bottom; and in this way they serve the purpose of affording buoyancy tanks or chambers to the ship; and also provide a strong construction.

In a further application of the tubular construction, this construction may be employed in connection with the bulk heads, either longitudinal or transverse; and in which case the bulk heads will be very much strengthened, and would in themselves constitute buoyancy spaces or chambers, the cylinders or tubes being connected by plates, or arranged between flat plating and connected up with same.

Dated this 1st. day of May, 1912.

E. R. ROYSTON & Co.,
Applicant's Patent Agents,
Tower Building, Water Street, Liverpool, and
265, Strand, London, W.C.

COMPLETE SPECIFICATION.

Improvements in or connected with Ships' Construction.

I, THOMAS TURTON JONES, of 656, Royal Liver Building, Pier Head, Liverpool, in the County of Lancaster, M.I.N.A., Naval Architect, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention has reference to the construction of ships; and has chiefly for its object to provide a construction which, when the ship is struck or damaged by collision or similar accident, shall limit or diminish the degree of loss of stability or safety of the ship due thereto, relatively to that they are liable to, if constructed according to the present or usual system. Or in other words, its chief object is to render such ships safer generally, and less liable to be sunk by being struck by or colliding with another ship or object, or like accident.

In a metal ship of the type to which the present invention is to be applied,

the sides and bottom, say up to or some distance above the water level of the ship, are formed or comprised of a plurality of large tubes, or tubular members, horizontally disposed, and in parallel, and extending for the full length of the ship, or for major portion of it, say, and all inter-connected and provided at intervals with transverse diaphragms or partitions (say from 20 to 40 feet apart), and with interspaced stiffening or strengthening members between the diaphragms, pitched apart at comparatively short intervals. The tubes or tubular members are placed closely together; and according to this invention, on the innerside of them there are web frames; and on the inside of these frames the inner plating or skin of the ship comes; and this plating or skin constitutes the vital shell of the ship; and it may be made stronger than the outer plating of the tubular construction, which constitutes the vulnerable part.

Thus in this system, the vital part (that is the real shell plating) is constructed with the web frames (and other usual or ordinary frames) outside the vital shell plating; and connected with these parts is the vulnerable portion, consisting of or comprising the outer plating or parts of the longitudinal tubular members, to which the outer shell a plating is not directly attached.

The invention will be further described with reference to the accompanying drawings, which illustrate it.

Figure 1 is a cross section of one modification of ship's construction according to this invention—of which Figure 1A is a detail, being a plan in section of the tubular construction; whilst Figure 2 is a transverse section showing another modification of the tubular construction—of which Figure 2A is a detail showing the tubular construction in section.

Referring to the drawings, *a* represents the horizontal tubular members, and *b* the transverse diaphragms in them, disposed at intervals apart, forming water-tight chambers such as described. *c* represents the outside shell plating—which in the modification shown in Figure 1, partly consists of the outer shell of the tubes *a*; and *d* is the inner or main vital shell plating. *e* represents the web frames on the inner side of the tubular members *a*; and, as shown, the inner or vital shell plating or skin *d* (which extends the full girth from the centre line of the ship, up to and above the water line) is on the inside of these frames; to which of course they will be directly attached; and all the parts will be suitably attached to one another as will be well understood to those skilled in shipbuilding.

In Figure 1 the tubes *a* are cylindrical, and do not occupy the whole of the vulnerable space on the sides; whereas in Figure 2, the tubular members or tubular construction is rectangular, and the tubular chambers *a* occupy the whole space between the inner vital or main shell plating *d*, and the outer and non-vital shell plating *c*; the frames, in the latter case, lying within these tubular chambers, or passing through them. In the modification in Figure 2, the lower horizontal portion of the upper-most tubular member *a* is shown to constitute also the upper part of the next tubular member *a* below it, and so on throughout the structure. In the bottom portion of the structure, these parts constitute, instead of the upper and lower parts, the sides of the chambers, whilst the two shell platings *c* and *d* constitute bottom and top of same respectively.

Referring to Figures 1 and 1A, the tubular members *a* in this case are about, say, from between 3 and 5 or 6 feet in diameter, and they are arranged closely together so as to lie in contact with each other at the top and bottom respectively; and they are fixed in recesses on their inner sides in the main web-frames *e*, whilst the outer shell plating *c* is made in the form of curved or concave plates, fastened to the outer sides of the cylindrical tubes *a*; the latter forming part of such outer shell.

At certain distances down, from the upper part of the side tubular construction, there are stringers *f*, which are connected to the inner plating *d* and

tubes *a*; whilst in the bottom of the ship these members *f* extend in some cases between the inner lining or plating shell *d*, and the tubes *a*, and in others between this inner lining, and the outer shell *c*, and are in the form of, or constitute longitudinal girders.

The ordinary or simple frames of the ship structure are designated *h*; and above the tubular construction described, the ordinary frames h^1 are carried up, and fastened to the ordinary shell plating or skin d^1, which is a continuation of the inner or vital plating *d* below; and this structure is carried up in the ship in the usual way. The lower ends of these frames h^1 will preferably be laid over, and in the same plane as the frames *h*; and to the outwardly bent portion d^2 of the shell *d*, which extends over the upper part of the tubular construction.

Similarly, above the tubular construction, the web frames c^1 will be carried up on the inside of the plating d^1, as in ordinary ships' construction; and these web frames will be in practical continuance of the web frames *c* of the tubular portions of the structure.

The tubes *a* are provided with ring stiffeners *i* at suitable intervals apart between the diaphragms *c*, their pitching apart being the same as that of the ordinary frames *h*.

In Figure 2, the web frames, and the ordinary frames, above the tubular construction, are carried up and built similarly as described with reference to Figure 1; the portion d^2 of the inner shell plating *d*, which extends between the inside vertical portion *d* and the outside vertical portion d^1, being in this case, horizontal, and a continuation of the deck *k*, of which, say, it forms a part.

It will be understood in all cases that different plates and parts will be jointed together in any suitable way known to shipbuilders, as may be desired or necessary.

The inner and vital shell plating *d* is preferably carried the whole length of the vessel, say to the fore and aft collision bulkheads, for the full displacement girth; and up the sides, to well above the load water line, as described; whilst the vulnerable portion of the ship, likewise extends for the full girth, and longitudinally to the collision bulkheads, forming a protection to the vital construction and skin.

The vulnerable shell may be say about 6 feet from the inner shell; and the outer or vulnerable shell *c* may be of lighter scantling than the inner shell *d*; and in the case of rectangular tubular members being employed, they may be stiffened longitudinally and transversely by angle-irons, stringers, and the like, and attached to the main stringers of the vessel, and the division plates forming the water-tight compartments.

It will be seen there will be no break in the vulnerable portion of the ship, and the ordinary transverse bulkheads, cross bunkers, *etc.*, extend only to the inner vital shell plating *d*.

Whilst, in the construction above described in connection with Figure 2, the tubular members *a* have been described as separate water-tight tubes, nevertheless, those above a point where usually in ships the tank margin of an ordinary tank bottom, comes, may if specially desired, communicate with each other vertically, so that all the side tubular members *a*, vertically, between the diaphragms *b*, form one chamber.

In the case shown in Figure 1 or where desired, holes may be provided in the web of the web frames *c*, or wherever desired, to give access between the spaces between the different frames.

The water-tight tubular members in the bottom of the ship may be utilized for containing water ballast, as usual; and in some parts at least, the side tubular members, may, if desired, be used and adapted as oil containing compartments or reserve bunkers; but primarily these members or water-tight chambers on the sides, are to serve only as reserve buoyancy chambers.

By this invention, the vital part of a ship is well protected, and damage to

the ship through collision or otherwise, will be confined almost entirely to the vulnerable and outer portion of the ship; namely, to the tubular members or chambers *a*, and to those of them which are immediately penetrated, or pierced; whilst all other tubular chambers or members not damaged or pierced, will retain their full buoyancy character and effect, thus reducing the flooding capacity or portion of a ship, due to the outer part being pierced by collision or otherwise, to a very small one; and reducing the angle of listing when pierced on one side, to a relatively small one. Consequently, the protection of the ship's buoyancy is very much increased, and the safety of the vessel considerably enhanced, when damage occurs through collision or otherwise.

The different compartments or tubular chambers will have covered "manholes" in connection with them, and they will be accessible only through such "manholes".

This tubular construction accomplishes several effects and ends, namely—in the first place it gives great transverse strength and uniform structural design; secondly, if the ship is struck below the water line, or at the sides, where this construction exists, the entrance of water to the ship will be limited to the portions of the water-tight chambers or divisions so damaged; that is to say they being longitudinal, the spaces between their diaphragms or divisions if cut or damaged on the outside, the inner part of the side structure of the ship is not so liable to be strained, or the web-frames and inner skin torn away. That is to say, the damage will be largely localised to the point of actual contact or piercing.

Furthermore, in any event, the formation in either case serves as reserve buoyancy spaces, limiting the flooding capacity, and therefore saving or reserving a large amount of displacement, which would otherwise be lost.

In some cases, this tubular or cylindrical construction may be employed horizontally across the ship, say at the lower deck, the cylinders being arranged longitudinally as in the sides and bottom; and in this way they serve the purpose of affording buoyancy tanks or chambers to the ship; and also provide a strong construction.

In a further application of the tubular construction, this construction may be employed in connection with the bulkheads, either longitudinal or transverse; and in which case the bulkheads will be very much strengthened, and would in themselves constitute buoyancy spaces or chambers, the cylinders or tubes being connected by plates, or arranged between flat plating and connected up with same.

It will be seen in the construction described, the frames (*c*, and *h*) of the ship according to this invention come or lie in contact with, and are directly attached to the inner shell or plating *d*, whereas their outer edges or parts do not extend to, and are not attached to the outer skin or plating directly, although this plating will be indirectly connected to the frames or some of the frames, *viz.*: the web-frames *e*; and my invention is therefore distinct or different from these constructions of ships heretofore proposed, where web-frames extend between an outer and inner skin or plating, to both of which they are directly attached.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. A ship's construction consisting of a plurality of longitudinal tubular members on the sides extending from the bottom to a point above the water line, and extending longitudinally for the full or a large portion of the ship and comprising or having an outer and inner skin or shell; and the frames of the ship connected with said members, being fastened only directly to the inner of said skins or shells; substantially as set forth.

2. A ship's construction comprising a plurality of longitudinal tubular members, and web frames attached to the inner shell or plating, but not extend-

ing to, and not attached to the outer shell or plating; the said tubular members being divided by transverse diaphragms or bulkheads, at relatively long distances apart; substantially as described.

3. The tubular ship's construction, substantially as set forth with reference to and shown in the drawings.

Dated this 5th day of June, 1912.

E. R. ROYSTON & Co.,
Applicant's Patent Agents,
Tower Building, Water Street, Liverpool, and
265, Strand, London, W.C.

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FIG. 1.

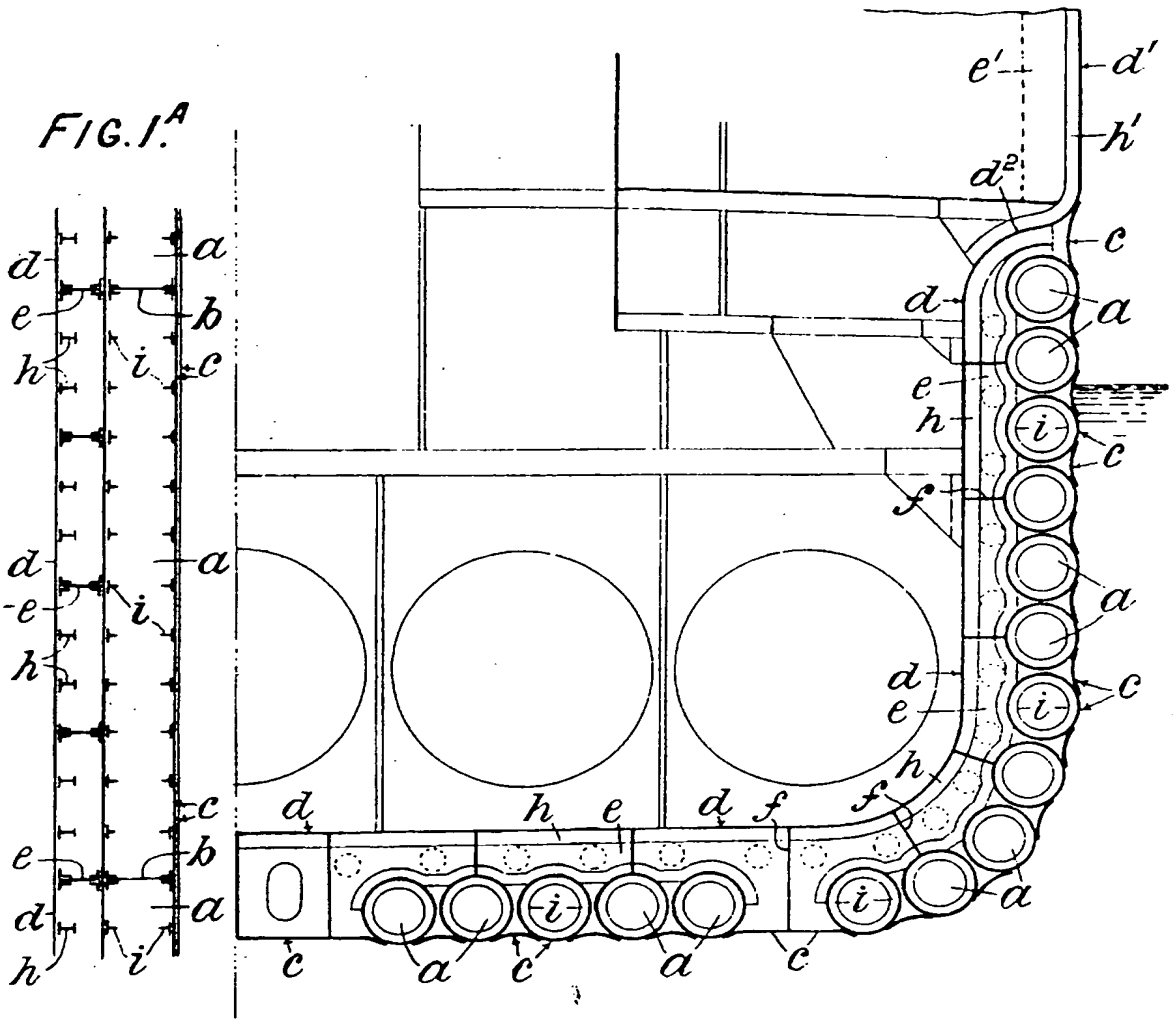

FIG. 2.

FIG. 2.A

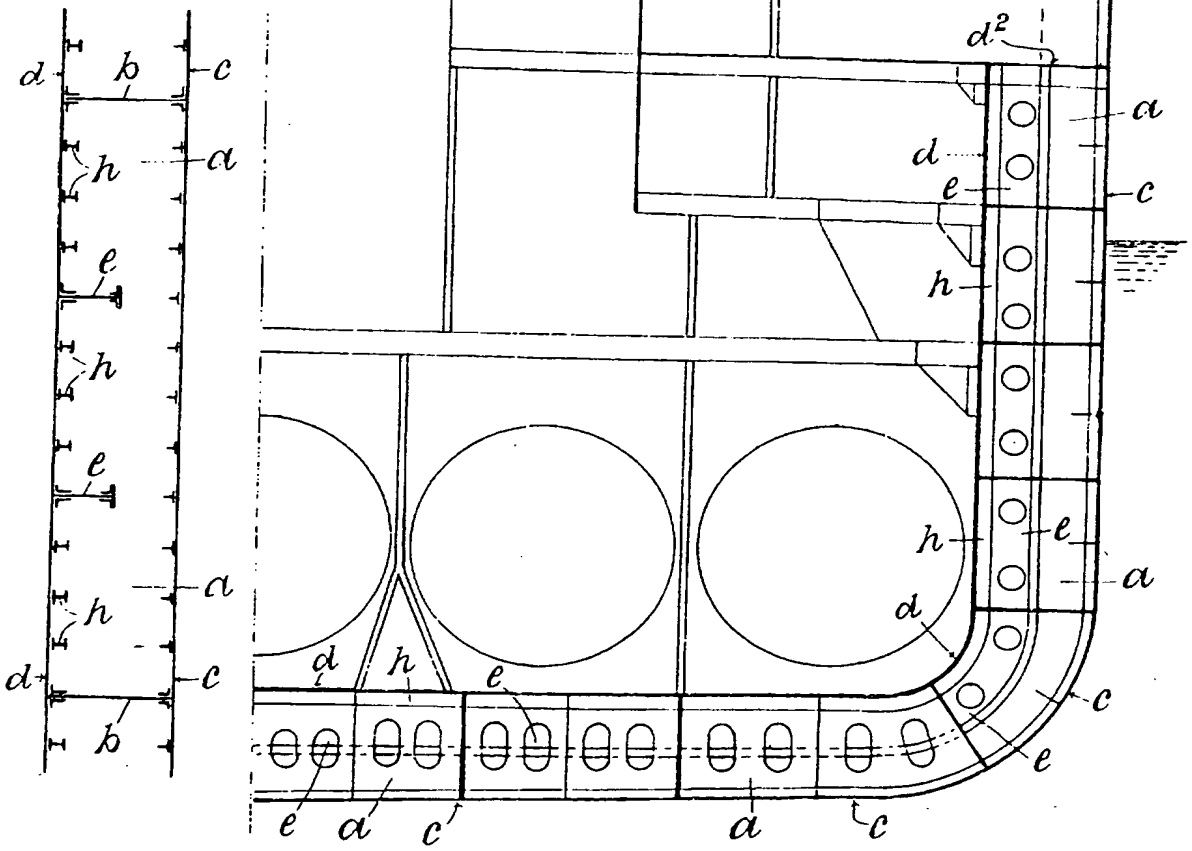

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FIG. 1.

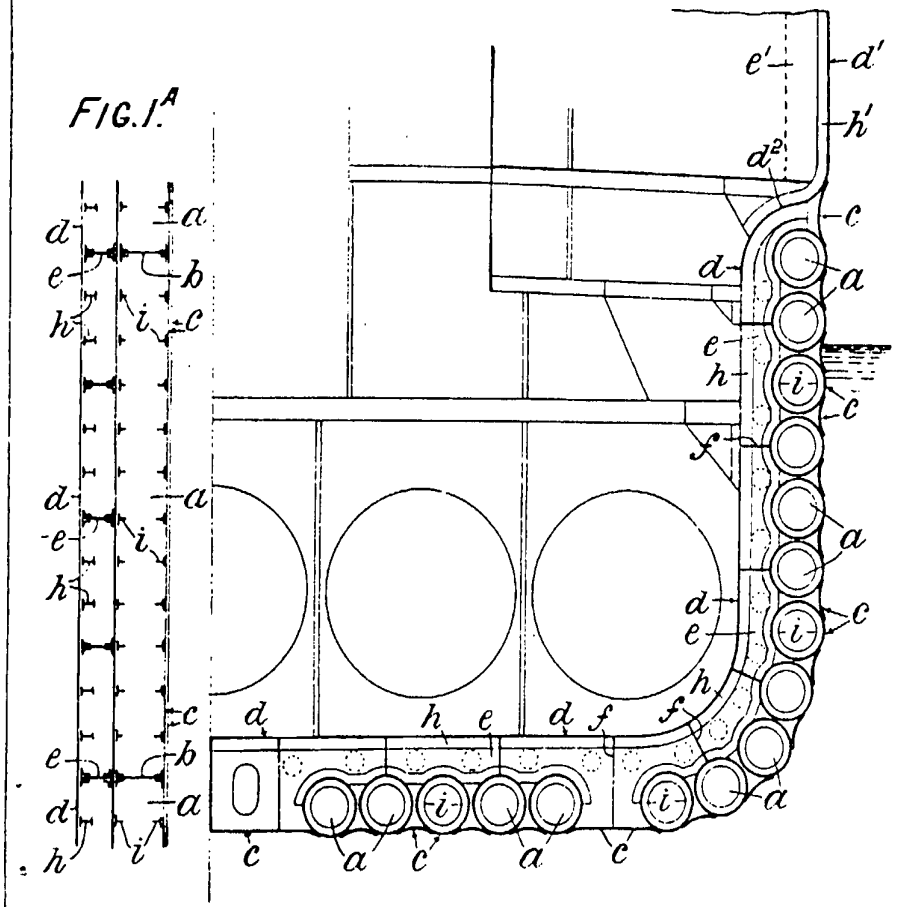

FIG. 2.